BUSINESS PLAN

PROJECT
Energy Efficient Retrofit
of the Municipal Hospital "St. Ivan Rilski"
Gorna Oriahovitsa
Bulgaria

SUMMARY

USAID – ECOLINKS programme

Grant No. C1-09-BG

Prepared by

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Project title	Project number	Date
“Energy Efficient Retrofit of the Municipal Hospital “St.Ivan Rilski in Gorna Oriahovitsa”	**Ecolinks** **Grant No. C1-09-BG**	**31.01.2001**
Client/Investor	Representative: Name, Position	Signature
Municipality of Gorna Oriahovitsa	**Nikola Kolev** **Mayor**	
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1. SUMMARY OF THE BUSINESS PLAN

1.1. INTRODUCTION

The major problem faced by Bulgarian municipalities in the field of energy efficiency is the absence of a sufficient number of high-quality projects and the shortage of funds at the disposal of the municipalities for financing of such projects.

The EcoLinks Program of the US Agency for International Development (USAID) renders considerable assistance for overcoming of the above mentioned barriers on the basis of promotion of the collaboration between local municipalities and enterprises and leading U.S. companies in the field of energy efficiency.

The objective of the project at the municipal hospital in the city of Gorna Oriahovitsa is to develop a proposal for diminishing of energy costs, respectively GHG emissions, through implementation of energy efficiency measures in the hospital building. One of the significant requirements to the proposal is that the project should be self-supporting and attractive for loan financing by local financial sources. These requirements have been met thanks to an **EcoLinks grant No. C1-09-BG** and the joint efforts of the project partners, comprising as follows:

The Municipality of Gorna Oriahovitsa – Project leader

Electrotek Concepts Inc., USA – Project partner

The Center for Energy Efficiency EnEffect - Associated partner

The Association of Energy Engineers - Bulgaria – consultant to the Municipality of Gorna Oriahovitsa

The partners have carried out a detailed energy audit of the hospital, established a "short list" of energy efficiency measures and conducted preliminary talks with the United Bulgarian Bank for procurement of funding, on the grounds of which they have jointly elaborated this Business Plan.

This business plan is the result of the team work of the Center for Energy Efficiency EnEffect, the Municipality of Gorna Oriahovitsa and Electrotek Concepts Inc., U.S.A. in the framework of the Project ENERGY EFFICIENT RETROFIT OF THE MUNICIPAL HOSPITAL "St. IVAN RILSKI", the city of Gorna Oriahovitsa, financed by the U.S. Agency for International Development (USAID) through the EcoLinks Program and is intended for submission to the United Bulgarian Bank (UBB).

1.1.1. Project phases

The implementation of the project for energy efficient retrofit of the Municipal Hospital "St. Ivan Rilski" in the city of Gorna Oriahovitsa comprises the following major phases:

- **Phase One** – Feasibility studies, including conducting of an energy audit, the results of which serve as the basis for identification of the most efficient technologies for retrofit of the hospital and investigation of the energy efficiency activities to be applied, as well as their environmental impact, technical and economic analyses and development of a business plan - **this phase is already completed.** The available funding for implementation of Phase One were provided through a subsidy, financed directly by Ecolinks. The subsidy was extended to the Municipality of Gorna Oriahovitsa as project leader and ELECTROTEK CONCEPTS, Inc. as project partner.

- **Phase Two** – Project implementation, comprising application of the package of identified energy efficient measures (ECOs) that are covered by this business plan.

At this stage of project development, following the detailed technical analysis and market studies, the implementation of the project is estimated at BGN 349,762 V.A.T. included (for overall financing of **Phase Two**). The proposed financing scheme comprises BGN 227,000 loan capital lent by UBB and BGN 122,762 contribution of the borrower - **the Municipality of Gorna Oriahovitsa.** The ratio between loan capital and equity contribution of the borrower is 65% **:** 35% (in compliance with the Bank's terms and conditions). Table 1.3 shows the investment costs and the proposed scheme for funding through loan capital and borrow's equity funds.

1.1.2. Energy conservation opportunities

On the basis of the detailed analysis of all aspects of application of the energy systems, their duty cycles and the state-of-repair of the building, this project offers a comprehensive solution of its requirements for efficient and cost-effective energy use at the present time. The work team analyzed more than 17 ECOs and conducted a technical and economic evaluation of four packages of implementation measures. The proposed package features a short payback period, investment size that fits in the framework of existing restrictions and due consideration of the possible future introduction of gas supply.

The project identifies 9 sets of technical measures for energy conservation (Energy conservation opportunities - ECOs) per **package,** conventionally given item Nos. from 1 to 9.

Measure ECO 1. *Partial retrofit of the heating system to heavy oil/gas fired hot water boiler.* This measure proposes reconstruction of one boiler PKM4 from steam to hot water, installation of new rotating bi-fuel burner with equipment and automation, replacement of two pipelines, installation of control equipment for heating and DHW supply. Based on 1999 heavy oil consumption this measure will produce savings of 89.5 tonnes of heavy oil.

Measure ECO 2. *Installation of Thermostatic Radiator Valves (TRV).* This measure proposes installation of Thermostatic Radiator Valves (TRV) on 841 radiators in the facility in blocks A, B,V,G,D, ER (BNMP), and in Pharmacy. Savings are achieved by proper control of the room temperature, elimination of excessive heat supply during the shoulder season, possibility to set-back of the temperature in unoccupied spaces and possibility to set a lower temperature in spaces not requiring comfort heating (storage, etc.). Based on 1999 heavy oil consumption this measure will produce savings of 26.4 tonnes of heavy oil.

Measure ECO 3. *Repair and Weatherstriping of Doors and Windows.* This measure proposes repair, refit and weather-stripping of the windows and doors including: replacement of broken window glass, retrofit of doors and hardware, replace the damaged putty on windows, installation of the rubber seals around the window gap length, painting of the windows and doors. The proposed measure will improve comfort level in the space by eliminating drafts close to windows. Based on 1999 heavy oil consumption this measure will produce savings of 22.3 tonnes of heavy oil.

Measure ECO 4. *Attic insulation.* This measure proposes insulation of the relatively large attic space floor on hospital building by spraying polyurethane foam insulation with 3.5 cm thickness and additional thermal resistance of 2.22 [m^2K/W]. Based on 1999 heavy oil consumption this measure will produce savings of 41.1 tonnes of heavy oil.

Measure ECO 5. *Energy Consumption Monitoring and Control System.* This measure proposes installation of metering, monitoring equipment and computer system for

improved energy management and cost allocation. Information will be used by the hospital management and the units dealing with energy consumption control. This measure will produce savings of 7.4 tonnes of heavy oil and 46.7 ÌWh of electricity.

Measure ECO 6. *Replacement of electromagnetic ballast of luminescent lighting fixtures with electronic ballast.* This measure proposes to replace the magnetic ballast in 400 lighting fixtures determined to be working for the longest hours per day with electronic, more energy efficient ballast. Based on 1999 electricity consumption this measure will produce savings of 40.3 ÌWh of electricity.

Measure ECO 7. *Automatic controls for the lighting system.* This measure proposes installation of automatic sensor based lighting controls which will automatically turn the part of the lights off when there is sufficient level of illumination in the space and the full capacity of the lighting is not required. It is suggested that lighting control is only installed in selected spaces based on the level of illumination, and thus on energy consumption level needed. Based on 1999 electricity consumption this measure will produce savings of 14.4 ÌWh of electricity.

Measure ECO 8. *Replacement of 75 W incandescent lamps with 15 W energy savings compact lamps.* This measure proposes replacing all incandescent bulbs with high efficiency compact bulbs, with utilization of the existing lighting fixtures. Based on 1999 electricity consumption this measure will produce savings of 128.2 ÌWh of electricity.

Measure ECO 9. *Load shifting for laundry, dryers and kitchen* This measure proposes installation of 2 “two-tariff” meters for the hospital laundry and kitchen facilities and minor reworking of the electrical switchboard to allow two-tariff billing for those facilities. By simple moving the work hours for the day shift for the laundry, dryers and partially the kitchen for later shift starting time, it is assessed that 48,360 kWh electricity consumption will be moved from “peak” to “day” tariff annually and charged at lower rate. This measure produces monetary savings and has no effect on energy consumption.

On the basis of the conducted detailed energy audit and analyses of the results it has been identified that the application of the above described package of energy conservation measures would help achieve the available **ENERGY CONSERVATION POTENTIAL** to the amount shown in Table 1.1.

Table 1.1
Energy conservation potential of the proposed package of ECOs

ECOs	Investment	Net Savings			SPB	NPVQ
	BGN	Tonnes Heavy oil	Electricity MWh	BGN/year	years	
Total	**332 802**	**187**	**230**	**126315**	**2.6**	**1,38**

Table 1.2 shows the value of investment costs for implementation of the individual measures of the project and the estimated net annual savings. It is important to note that the assessment made over the full project life, up to the year 2011, reveals also considerable financial benefits for the project owner after maturity of the loan.

Table 1.2
Investments and savings till loan maturity

1	Measure - ECO	Investment	Savings					SPB
			2001	2002	2003	2004	2005	
		BGN	BGN	BGN	BGN	BGN	BGN	Years
1	Partial retrofit of the heating system to heavy oil/gas fired hot water boiler.	125,134	8,004	47,489	47,489	47,489	30,228	2.6
2	Installation of Thermostatic Radiator Valves (TRV)	22,218	2,358	13,991	13,991	13,991	8,977	1.6
3	Repair and Weatherstriping of Doors and Windows	32,582	4,328	11,813	11,813	11,813	6,788	2.8
4	Attic insulation	84,295	7,986	21,800	21,800	21,800	1,2426	3.9
5	Energy Consumption Monitoring and Control System	33,406	2,694	9,005	9,005	9,005	4,657	3.7
6	Replacement of electromagnetic ballast of luminescent lighting fixtures with electronic ballast.	13,600	1,084	4,382	4,382	4,382	2,087	3.1
7	Automatic controls for the lighting system	5,623	387	1,564	1,564	1,564	745	3.6
8	Replacement of 75 W incandescent lamps with 15 W energy savings compact lamps	15,338	3,448	13,944	13,944	13,944	6,641	1.1
9	Load shifting for laundry, dryers and kitchen	606	471	2,998	2,998	2,998	1,582	0.2
	Other costs and reserve	16,960		-670	-1150	-1150	-480	
	Total	349,762	30,760	126,315	125,836	125,836	73,651	2.77

The relatively low values for the payback of the individual measures and the entire package, presented in Tables 1.1 and 1.2, are a proof of the feasibility of the selected technical solutions.

The implementation of the energy conservation measures as envisaged in this project will produce net savings to the amount of BGN 126,315/year at a payback period of 2.77 years.

1.2. THE BORROWER

The Municipality of Gorna Oriahovitsa is the owner of the project and the borrower. The Municipality of Gorna Oriahovitsa is a medium-sized municipality, extending over an area of 310 ê ì^2 and comprising 13 human settlements with a total population of 57,900 inhabitants. The annual budget of the municipality for 1999 was BGN 10,176,986. The Mayor of the municipality is Mr. Nikola Kolev.

1.3. FINANCING SCHEME

According to the approved time schedules for implementation and financing of the individual project activities, the energy efficient retrofit should be completed by the end of October 2001 and the site should be commissioned and resume regular operation as of November 1, 2001.

Table 1.3
Investment size and proposed financing scheme

Expenditures	***BGN***	***%***
Basic investment	**318,146**	**91**
Technical reserve	**11,360**	**3**
Price reserve	**13,401**	**4**
General 2% reserve	**6,855**	**2**
Investment total with reserves	**349,762**	**100**
Capital structure	***BGN***	***%***
Loan	**227,000**	**65**
Equity capital	**16,262**	**5**
Subsidy (grant) from an international fund	**106,500**	**30**
Investment total	**349,762**	**100**
Financing scheme	***BGN***	***%***
Amount of required loan	**227,000**	**65**
Borrower's contribution	**122,762**	**35**
Investment total	**349,762**	**100**

The scheme of loan disbursement by UBB and contribution of equity assets by the Municipality of Gorna Oriahovitsa is shown in Table 1.4. The proposed scheme is based on an optimum investment scheme taking due account of the seasonal nature of energy consumption at the Municipal Hospital "St. Ivan Rilski" and respectively the seasonal nature of energy conservation in the course of the year.

Table 1.4
Financing scheme

	03.2001	**04.2001**	**05.2001**	**06.2001**	**07.2001**	**08.2001**	**09.2001**	**10.2001**	**11.2001**	**12.2001**
Loan - UBB				**28,000**				**199,000**		
Gorna Oriahovitsa Municipality	**650**	**5,379**	**7,726**	**109,009**						
Total by the end of the month	**650**	**5,379**	**7,726**	**137,009**				**199,000**		
Total accumulated	**650**	**6,029**	**13,755**	**150,763**				**349,762**		

1.4. CASHFLOW ANALYSIS AND RISK ANALYSIS

1.4.1. Cashflow analysis

The team has conducted an analysis of the financial indicators of the project with due account of the outcome of the preliminary negotiations between the Municipality of Gorna Oriahovitsa and UBB about the terms and conditions of the loan agreement. The interest on the principal from June 2001 till the loan maturity date has been assumed to be 15 %, i.e. 10% above the forecasts for the nominal interest rate. Since the current nominal interest rate is 3.96 %, the baseline scenario makes a conservative presumption that the interest rate for loans of this type will not exceed 15% for the period of loan validity. The loan will be disbursed at two portions, respectively on June 1, 2001 and October 1, 2001. The borrower will begin repayment of the monthly interest on the principal as of December 31, 2001 till February 28, 2002 including. The balance on the loan amount (interest and principal) will be paid off at equal monthly installments, whereby the annuity repayment begins on March 31, 2002 and the loan maturity date is May 30,.2005. This type of repayment scheme is proposed because of the uneven rate of savings and because of the fact that the first month of actual savings is November 2001.

In the baseline scenario the payback period is 2.77 years. The Internal Rate of Return of the total capital investment is IRR= 36 %. At a real interest rate of 8.49 %, the Net Present Value is BGN 466,699 for the economic life cycle of project - 10 years, and the Net Present Value Quotient /NPVQ/ is 1.33, that indicates that the project is profitable.

The financial indicators of the investment demonstrate both the feasibility and profitability of the project, as well as its attractiveness for rapid implementation.

It is important to note that in the baseline scenario the cashflow analysis an assumption is made that the prices of electricity and heavy oil will not increase and that the energy consumption will remain constant provided there is no expansion of the activities of the Municipal Hospital "St. Ivan Rilski". Moreover, the financial analysis takes into account only the benefits from energy savings and does not include the considerable amount of benefits from the diminished loss of 520 tonnes of water for technical purposes and its treatment.

1.4.2. Sensitivity analysis and risk analysis

In order to check the characteristics of the financial result of the project the team has reviewed several sensitivity scenarios that might threaten the financial viability of the project and has analyzed the following risks:

- Risk of non-completion of the project, that involves:
    - Risk of capital cost overruns
    - Start-up delay risk
- Operation risk (diminishing of savings due to wrong operation or incorrect project management)
- Energy price risk (low prices of electricity and heavy oil).

The sensitivity scenarios comprise:

- Capital cost overruns by 10% to 30% beyond the approved technical and price reserves.
- Start-up delay of the range of 1 month for any ECOs package.
- Reduction of the annual savings by 14% to 30 % due to operational problems and incorrect management.
- Low electricity prices (up to 10% below the assumed rates) and heavy oil (up to 20% below the assumed rates) for the project life-cycle.
- In the worst case scenario the capital cost overruns are assumed to be 10% and the reduction of savings due to operation and price risk is equal to 30%. The start-up delay risk is 1 month for all ECOs.

Results: In all scenarios it has been found out that the financial indicators of the project are influenced by the reviewed risks to an extent that allows them to retain its viability. In all scenarios the amount of diminishing of the financial results is acceptable, including with respect to the increase of the payback period by some 0.28 to 1.19 years, diminishing of the Internal Rate of Return by 2.3 % to 14.8 % and diminishing of the Net Present Value by BGN 17,734 to 259,292. Even in the worst case scenario the resulting project parameters of 4.36 years payback period, 17.5% Internal Rate of Return and BGN 160,016 positive Net Present Value are acceptable.

The sensitivity and risk analysis reveals the stability of the financial results of the project and clearly demonstrates that the reviewed risks are minor.

1.5. CONCLUSION AND ESTIMATED RESULTS

The principal task and therefore the principal result of the proposed project is reduction of the energy consumption of the **Municipal Hospital "St. Ivan Rilski"** and respectively of the energy costs of the budget of the Municipality of Gorna Oriahovitsa. The technical analysis shows that the measures proposed for implementation will produce savings of 12.3% in electricity consumption and 51.6% in heat (heavy oil) consumption, compared to the consumption figures for 1999. The above percentages of reduction in the consumption rates for the different energy carriers correspond to net savings of BGN 30,760 in 2001, BGN 126,315 in 2002, BGN 125,836 in 2003, BGN 125,836 in 2004 and BGN 110,498 by the end of 2005. It is worth noting that the analysis indicates that these levels of substantial financial benefits will be retained during the entire life cycle of the project till the year 2011.

A considerable positive output of the project implementation is the reduction of GHG emissions. As a result of the improved efficiency of the system's operation, the reduced heat losses in the building, the emissions of CO_2 equivalent due to heavy oil combustion will diminish by 53% and the emissions produced for generation of the required electricity will diminish by 12%. The total reduction of the emissions of CO_2 equivalent for the entire forecast period from 2001 till 2011 is estimated to be 9,752 tonnes.

The reduction in the consumption of energy carriers leads to a similar reduction of the emissions in the air of harmful gases of local significance. The most important one in this case is the diminishing of the emissions of sulphur oxides. Under the planned production output, the emissions of sulphur oxides are estimated to be reduced by 169 tonnes for the forecast period from 2001 till 2011.

The application of the technical solutions for the heat supply system, as envisaged in the project, leads to minimizing the losses of additional water for the boiler system. Under the planned production output a minimum of 5,000 m^3 water will be saved during the project life cycle from 2001 till 2011.

The implementation of the project will produce a number of other benefits as well, such as reduced maintenance costs and improved reliability of the equipment.

The thus effected technical and financial analysis shows that the proposed project is cost-effective from a financial point of view and guarantees high return on investments within a period of less than four yours under all development scenarios that were analyzed. In addition to the attractive financial outputs, the project offers supplementary material and environmental benefits.

There are comprehensive grounds to recommend urgent implementation of the project in compliance with the proposed financial schemes.